

REMARKS

INTRODUCTION:

In accordance with the foregoing, claims 1, 12, 19 and 33 have been amended. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1-35 are pending and under consideration. Reconsideration is respectfully requested.

ENTRY OF RESPONSE UNDER 37 C.F.R. §1.116:

Applicants request entry of this Rule 116 Response and Request for Reconsideration because:

(a) it is believed that the amendments of claims 1, 12, 19 and 33 put this application into condition for allowance;

(b) the amendments were not earlier presented because the Applicants believed in good faith that the cited prior art did not disclose the present invention as previously claimed;

(c) the amendments of claims 1, 12, 19 and 33 should not entail any further search by the Examiner since no new features are being added or no new issues are being raised; and

(d) the amendments do not significantly alter the scope of the claims and place the application at least into a better form for appeal. No new features or new issues are being raised; and/or

The Manual of Patent Examining Procedures sets forth in §714.12 that "[a]ny amendment that would place the case either in condition for allowance or in better form for appeal may be entered." (Underlining added for emphasis) Moreover, §714.13 sets forth that "[t]he Proposed Amendment should be given sufficient consideration to determine whether the claims are in condition for allowance and/or whether the issues on appeal are simplified." The Manual of Patent Examining Procedures further articulates that the reason for any non-entry should be explained expressly in the Advisory Action.

REJECTION UNDER 35 U.S.C. §112:

In the Office Action, at page 2-3, claims 1-35 were rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth therein. This rejection is traversed and reconsideration is requested.

It is respectfully submitted that Examples 2-5 clearly recite embodiments in which the mixed organic solvent is less than 50% by weight of the weak polar solvent (see ratios in Table 1).

Independent claim 1, and independent claims 12, 19 and 33 in similar fashion, has been amended to recite: "A lithium-sulfur battery comprising: a negative electrode including a negative active material selected from the group consisting of materials in which lithium intercalation reversibly occurs, a lithium alloy, and a lithium metal; a positive electrode including a positive active material comprising at least one sulfur-based compound selected from the group consisting of elemental sulfur and organosulfur compounds, and an electrically conductive material; and an electrolyte including a sulfur-containing electrolyte salts and mixed organic solvents; wherein the mixed organic solvents of said electrolyte comprise at least ~~two~~ three different groups solvents, each selected from ~~the a different group of a set of groups, the set of groups~~ consisting of a weak polar solvent group, which is capable of dissolving elemental sulfur, a strong polar solvent group, which is capable of dissolving lithium polysulfide, and a lithium protection solvent group, which forms a good protective layer on a lithium surface; ~~the mixed organic solvents comprise at least two or more solvents selected from same group, and where the weak polar solvent group is utilized, the mixed organic solvent includes less than 50% by weight of the weak polar solvent.~~"

The above terminology is submitted to clarify that at least three different solvents are selected, each from a different group of a set of three groups which are a weak polar solvent group, a strong polar solvent group and a lithium protection solvent group.

Hence, it is respectfully submitted that amended independent claims 1, 12, 19 and 33 are definite under 35 U.S.C. §112, second paragraph. Since claims 2-11, 13-18, 20-32 and 34-35 depend from amended claims 1, 12, 19 and 33, claims 2-11, 13-18, 20-32 and 34-35 are submitted to be definite under 35 U.S.C. §112, second paragraph, for at least the reasons that amended claims 1, 12, 19 and 33 are submitted to be definite under 35 U.S.C. §112, second paragraph.

REJECTION UNDER 35 U.S.C. §102:

In the Office Action, at pages 3-8, claims 1-33 were rejected under 35 U.S.C. §102 in view of Chu et al. (USPN 6,030,720; hereafter, Chu). This rejection is traversed and reconsideration is requested.

Independent claim 1, and in similar fashion, independent claims 12, 19 and 33, has been amended to recite: " A lithium-sulfur battery comprising: a negative electrode including a negative active material selected from the group consisting of materials in which lithium intercalation reversibly occurs, a lithium alloy, and a lithium metal; a positive electrode including a positive active material comprising at least one sulfur-based compound selected from the group consisting of elemental sulfur and organosulfur compounds, and an electrically conductive material; and an electrolyte including a sulfur-containing electrolyte salts and mixed organic solvents; wherein the mixed organic solvents of said electrolyte comprise at least ~~two~~ three different groups-solvents, each selected from ~~the~~ a different group of a set of groups, the set of groups consisting of a weak polar solvent group, which is capable of dissolving elemental sulfur, a strong polar solvent group, which is capable of dissolving lithium polysulfide, and a lithium protection solvent group, which forms a good protective layer on a lithium surface;

~~the mixed organic solvents comprise at least two or more solvents selected from same group, and where the weak polar solvent group is utilized, the mixed organic solvent includes less than 50% by weight of the weak polar solvent."~~

It is clear that Chu et al. teaches using two solvents: a main solvent and a cosolvent, whereas amended independent claim 1, and amended independent claims 12, 19 and 33 in similar fashion, of the present invention requires the use of an electrolyte comprising at least three different solvents, each selected from a different group of a set of groups, the set of groups consisting of a weak polar solvent group, which is capable of dissolving elemental sulfur, a strong polar solvent group, which is capable of dissolving lithium polysulfide, and a lithium protection solvent group, which forms a good protective layer on a lithium surface.

Since it is known to those skilled in the art that a mixture of three different solvents generally has different characteristics than a mixture that includes only two of the three different solvents, it is respectfully submitted that amended independent claims 1, 12, 19 and 33 are not anticipated under 35 U.S.C. §102 by Chu (USPN 6,030,720). Hence, since claims 2-11, 13-18,

20-32 and 34-35 depend from amended claims 1, 2, 19 and 33, respectively, claims 2-11, 13-18, 20-32 and 34-35 are submitted not to be anticipated by Chu (USPN 6,030,720) under 35 U.S.C. §102 for at least the reasons that amended claims 1, 12, 19 and 33 are not anticipated by Chu (USPN 6,030,720) under 35 U.S.C. §102.

In the Office Action, at pages 6-8, claims 1-33 were rejected under 35 U.S.C. §102 in view of Nimon et al. (USPN 6,225,002; hereafter, Nimon). This rejection is traversed and reconsideration is requested.

As noted above, the independent claims 1, 12, 19 and 33 have been amended to recite that the electrolyte includes a sulfur-containing electrolyte salt and mixed organic solvents, wherein the mixed organic solvents of said electrolyte comprise at least three different solvents, each selected from a different group of a set of groups, the set of groups consisting of a weak polar solvent group, which is capable of dissolving elemental sulfur, a strong polar solvent group, which is capable of dissolving lithium polysulfide, and a lithium protection solvent group, which forms a good protective layer on a lithium surface.

Since Nimon teaches utilizing the same combination of two solvents utilized by Chu (see above and also col. 6, lines 20-50 of Nimon), amended claims 1, 12, 19 and 33 are respectfully submitted not to be anticipated by Nimon under 35 U.S.C. §102. Hence, since claims 2-11, 13-18, 20-32 and 34-35 depend from amended claims 1, 2, 19 and 33, respectively, claims 2-11, 13-18, 20-32 and 34-35 are not anticipated by Nimon under 35 U.S.C. §102 for at least the reasons that amended claims 1, 12, 19 and 33 are not anticipated by Nimon under 35 U.S.C. §102.

In the Office Action, at page 8, claims 1-35 were rejected under 35 U.S.C. §102 in view of Katz et al. (USPN 6,358,643, which is a continuation in part of Chu et al.; hereafter, Katz). This rejection is traversed and reconsideration is requested.

As noted above, the independent claims 1, 12, 19 and 33 have been amended to recite that the electrolyte includes a sulfur-containing electrolyte salt and mixed organic solvents, wherein the mixed organic solvents of said electrolyte comprise at least three different solvents, each selected from a different group of a set of groups, the set of groups consisting of a weak polar solvent group, which is capable of dissolving elemental sulfur, a strong polar solvent group, which is capable of dissolving lithium polysulfide, and a lithium protection solvent group, which forms a good protective layer on a lithium surface.

Since Katz teaches utilizing the same combination of two solvents utilized by Chu (see above and also col. 10, lines 14-54 of Katz), amended claims 1, 12, 19 and 33 are respectfully submitted not to be anticipated by Katz under 35 U.S.C. §102. Hence, since claims 2-11, 13-18, 20-32 and 34-35 depend from amended claims 1, 2, 19 and 33, respectively, claims 2-11, 13-18, 20-32 and 34-35 are not anticipated by Katz under 35 U.S.C. §102 for at least the reasons that amended claims 1, 12, 19 and 33 are not anticipated by Katz under 35 U.S.C. §102.

CONCLUSION:

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited. At a minimum, this Amendment should be entered at least for purposes of Appeal as it either clarifies and/or narrows the issues for consideration by the Board.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited and possibly concluded by the Examiner contacting the undersigned attorney for a telephone interview to discuss any such remaining issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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